

Claims:

1. A method of optimizing spare component management for a network having a plurality of nodes, comprising:
 - obtaining availability parameters associated with an inventory of spare
 - 5 components; and
 - determining a plurality of management configurations in response to said availability parameters, each of said plurality of management configurations comprising at least one warehouse node selected from said plurality of nodes and a quantity of spare components in said inventory to be stored at said at
 - 10 least one warehouse node.
2. The method of claim 1, further comprising:
 - selecting at least one warehouse configuration for said plurality of nodes;
 - and
 - 15 repeating said determining step for each said warehouse configuration.
3. The method of claim 2, wherein said at least one warehouse configuration comprises a distributed warehouse configuration and a centralized warehouse configuration.
- 20 4. The method of claim 1, wherein said inventory of spare components is defined by a plurality of component types, and said availability parameters comprise at least one of a failure rate, a minimum repair time, a restocking time, and a stockout probability associated with each of said plurality of
- 25 component types.
5. The method of claim 4, further comprising:
 - for each of said plurality of management configurations, computing an expected downtime of said network using said minimum repair time associated
 - 30 with at least one of said plurality of component types.
6. The method of claim 5, wherein, for each of said plurality of management

configurations, said expected downtime of said network is further computed using delivery times from said at least one warehouse node to remaining ones of said plurality of nodes.

5 7. The method of claim 4, further comprising:

obtaining a critical repair time associated with each of said plurality of component types; and

for each of said plurality of management configurations, computing a number of expected critical repair time violations.

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8. The method of claim 4, wherein said determining comprises:

obtaining a target stockout probability for each of said plurality of component types;

for each of said plurality of management configurations, computing said
15 quantity of spare components to be stored at said at least one warehouse node
by adjusting a quantity of each of said plurality of component types until said
respective stockout probability is less than or equal to said respective target
stockout probability.

20 9. The method of claim 1, wherein said inventory of spare components is
obtained dynamically from said network.

10. The method of claim 1, wherein said availability parameters are obtained
dynamically from said network.

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11. A computer readable medium having stored thereon instructions that, when
executed by a processor, cause the processor to perform a method of
optimizing spare component management for a network having a plurality of
nodes, comprising:

30 obtaining availability parameters associated with an inventory of spare
components; and

determining a plurality of management configurations in response to said
availability parameters, each of said plurality of management configurations

comprising at least one warehouse node selected from said plurality of nodes and a quantity of spare components in said inventory to be stored at said at least one warehouse node.

- 5 12. The computer readable medium of claim 11, further comprising:
 selecting at least one warehouse configuration for said plurality of nodes;
and
 repeating said determining step for each said warehouse configuration.
- 10 13. The computer readable medium of claim 12, wherein said at least one warehouse configuration comprises a distributed warehouse configuration and a centralized warehouse configuration.
- 15 14. The computer readable medium of claim 11, wherein said inventory of spare components is defined by a plurality of component types, and said availability parameters comprise at least one of a failure rate, a minimum repair time, a restocking time, and a stockout probability associated with each of said plurality of component types.
- 20 15. The method of claim 4, further comprising:
 for each of said plurality of management configurations, computing an expected downtime of said network using said minimum repair time associated with at least one of said plurality of component types.
- 25 16. The computer readable of claim 15, wherein, for each of said plurality of management configurations, said expected downtime of said network is further computed using delivery times from said at least one warehouse node to remaining ones of said plurality of nodes.
- 30 17. The computer readable medium of claim 14, further comprising:
 obtaining a critical repair time associated with each of said plurality of component types; and
 for each of said plurality of management configurations, computing a

number of expected critical repair time violations.

18. The computer readable medium of claim 14, wherein said determining comprises:

- 5 obtaining a target stockout probability for each of said plurality of component types;
 for each of said plurality of management configurations, computing said quantity of spare components to be stored at said at least one warehouse node by adjusting a quantity of each of said plurality of component types until said
10 respective stockout probability is less than or equal to said respective target stockout probability.

19. An apparatus for optimizing spare component management for a network having a plurality of nodes, comprising:

- 15 means for obtaining availability parameters associated with an inventory of spare components; and
 means for determining a plurality of management configurations in response to said availability parameters, each of said plurality of management configurations comprising at least one warehouse node selected from said
20 plurality of nodes and a quantity of spare components in said inventory to be stored at said at least one warehouse node.

20. A system optimizing spare component management for a network having a plurality of nodes, comprising:

- 25 a processing unit having access to one or more storage devices;
 at least a portion of the one or more storage devices storing an inventory of spare components and availability parameters associated with said inventory;
 at least another portion of said one or more storage devices having a
30 program product configured to determine a plurality of management configurations in response to said availability parameters, each of said plurality of management configurations comprising at least one warehouse node selected from said plurality of nodes and a quantity of spare components in

said inventory to be stored at said at least one warehouse node.